IBM

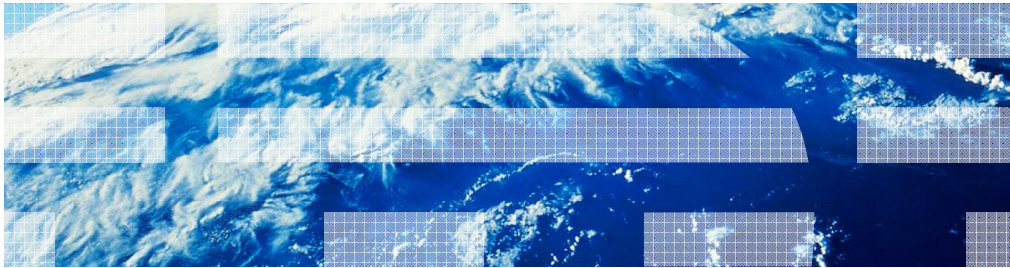# IBM WebSphere CloudBurst Appliance V2.0

License-aware management

This presentation describes the license-aware management capabilities that are available in IBM WebSphere® CloudBurst™ Appliance.

Table of contents

- Overview of license tracking
- License awareness in WebSphere CloudBurst
- How does PVU counting work?

License-aware management

This presentation starts out with an overview of license tracking and awareness for WebSphere CloudBurst. License awareness comes in two flavors – first, integration with the IBM License Metric Tool, and second, native license awareness capability that is built directly into the appliance. This presentation focuses on the native license tracking and license aware placement capabilities in the IBM WebSphere CloudBurst Appliance. The last section describes some key concepts surrounding how IBM counts processor value units, or PVUs, to calculate license consumption.

Goals of license awareness

- In cloud environments, license usage can be volatile
  - Hard to understand how licenses are being consumed over time
  - Easy to inadvertently overuse purchased licenses

- License awareness offers these benefits:
  - Generate reports to monitor usage
    - Help with long- and short-term spending plans
    - Use for invoicing
  - View all product licenses and entitlements
  - Enforce deployment behavior based on license usage
  - Control software cost

License-aware management

WebSphere CloudBurst enables rapid provisioning of WebSphere Application Server virtual machines. As virtual machines are being built up and torn down, license consumption changes quickly. In a volatile environment like this, it can be difficult to understand how licenses are being consumed over time and easy to inadvertently overuse purchased licenses. The license awareness capabilities in WebSphere CloudBurst are designed to help you monitor license usage, which ultimately helps you to control software cost. Using these new license tracking features, you are able to track licenses that are being consumed, view all of your product licenses and entitlements, and optionally enforce deployment behavior based on the number of licenses that you have available – for example, not allowing a virtual machine to be created if the required licenses are not available. Taken together, this functionality helps you with your short- and long-term plans for software spending, allowing you to better control your software cost.

It is important to understand that these license awareness capabilities are not designed to help you minimize your license usage. That is, the appliance is not actively making deployment decisions that will help you to reduce your overall license consumption. Before deploying any virtual systems, you have already purchased all of the licenses required to support them – so once you own these licenses, you might as well use as much of your entitlement as needed to support your operating environment. This is analogous to a cell phone plan – you have a certain number of minutes to use each month that you are going to pay for regardless of how many you use, so you might as well use them all. In a similar vein, the license tracking implementation is designed to help you use all the licenses you have without going over the license pool that you have purchased. Not only are there enforcement options to keep you from going over your license pool, but you can also receive warnings when you are approaching the limit of your license allocation and view reports of your license usage over time.

License awareness, two parts (1 of 2)

Catalog > Product Licenses page of web console

Product Licenses

License reporting   (1)

⊞ Track license usage

- 1) Integration with the IBM License Metric Tool
  – License Metric Tool available as a separate no-charge product
  – IBM License Metric Tool agent is included in deployed virtual systems
  – Agent sends license usage data to the tool for reporting

⊞ Download license usage

License awareness   (2)

☐ Notify virtual image owners when license usage reaches the thresholds set below

IBM products

Below are the products that can be deployed from this appliance. The list is generated by checking the contents of your virtual images against the product list in the IBM Software Catalog. You can specify how many processor value units (PVUs) you own for each product. When enabled, license awareness will alert you when PVU usage approaches a given threshold.

⊞ Update IBM Software Catalog and Processor Value Unit (PVU) Table

Product	Product ID	Enforcement	Licenses owned (PVUs)	Notify if usage reaches	Licenses in use (PVUs)	Licenses reserved (PVUs)	In the cloud now
IBM WebSphere Application Server Hypervisor Edition	5724-X89	Ignore	0	90.0 %	0	0	0 virtual systems
IBM WS App Svr Hypervisor Ed for Novell SLES on Sys z-Novell Sub required	5725-A11	Ignore	0	90.0 %	0	0	0 virtual systems
IBM WAS Hypervisor Ed for Novell SUSE Linux Enterprise Svr for System z	5725-A12	Ignore	0	90.0 %	0	0	0 virtual systems
IBM WebSphere Application Server Hypervisor Edition on AIX	5725-A25	Ignore	0	90.0 %	0	0	0 virtual systems
IBM WebSphere Application Server Hypervisor Edition on RHEL	5725-A26	Ignore	0	90.0 %	0	0	0 virtual systems
IBM WebSphere Application Server Hypervisor Edition Intelligent Management Pack	5725-A27	Ignore	0	90.0 %	0	0	0 virtual systems

4   License-aware management   © 2010 IBM Corporation

The first part of license awareness provided with the appliance is integration with the IBM License Metric Tool, which is a separate no-charge product used for license tracking across a broad range of IBM software products. There is an IBM License Metric Tool server, that you point to from the appliance configuration. The virtual images that the appliance deploys include the IBM License Metric Tool agent. This agent runs on the VMs in the cloud and collects data about the software running there so that the server is able to report on your overall license usage. There is a separate presentation available that goes into more depth on the functionality of the IBM License Metric Tool. This presentation focuses on the native license tracking capabilities of IBM WebSphere CloudBurst Appliance.

License awareness, two parts (2 of 2)

- 2) Native license tracking in WebSphere CloudBurst
  – Configure pools of licenses for software products in your virtual images
  – Monitor license usage
  – Determine placement based on license availability
  – Generate audit reports of license usage in the cloud

Catalog > Product Licenses page of web console

5 License-aware management © 2010 IBM Corporation

In addition to the IBM License Metric Tool integration, the appliance contains new native capabilities for license tracking that are being added in V2.0. This includes the ability to configure your license entitlement by product, track license usage, determine where or whether to place virtual machines based on license availability, and the ability to download audit records of your license consumption. The next section of the presentation covers these license tracking capabilities in more detail.

Section

License awareness in WebSphere CloudBurst

License-aware management

This section of the presentation describes key terms related to license tracking and then describes how to configure and use the license awareness features in WebSphere CloudBurst.

Licensing terminology

- **Processor value unit (PVU) licensing:** pricing structure for software that takes into account the type and number of processors available to installed products
  - Licenses are tracked in PVUs, not as a simple count of the number of instances of a product
  - For WebSphere CloudBurst, the number of PVUs consumed will depend on:
    - The type of hardware available in the cloud
    - The number of virtual processors assigned to the virtual machines
    - Current® PVU consumption for a set of physical hardware
- **Software catalog:** an IBM-maintained list of signatures for all IBM software products – product, version, release, component
- **PVU table:** an IBM-maintained list of conversion ratios for pricing with different types of processors

License-aware management

In order to understand how license tracking works in WebSphere CloudBurst, you need to know some of the key concepts and terms behind how IBM calculates license consumption. IBM uses processor value unit licensing. A processor value unit, or PVU, is a measure of license consumption based on the number and type of processors in the physical machine where you are running your software products. IBM tracks licenses using PVUs and not as a simple count of the number of instances of a product. For WebSphere CloudBurst, the number of PVUs consumed by a product will depend on the type of hardware available in the cloud, the number of virtual processors assigned to the virtual machines, and the current PVU consumption for a set of physical hardware. In WebSphere CloudBurst, PVUs are counted against a product ID, or PID. The software catalog is an IBM-maintained list of signatures for all IBM software products, including the product name, ID, version, release, and component. IBM provides several virtual images that the appliance can deploy, and sometimes these images contain multiple products that you can track licenses for. These products are identified in the virtual image by a new product ID field that is a part of the image metadata. Finally, the PVU table is an IBM-maintained list of conversion ratios for pricing with different types of processors. Your appliance configuration must include a software catalog and a PVU table in order to enable license tracking and license aware placement. These files are maintained by IBM and available through links on the Product Licenses page of the appliance web console.

Product Licenses page

Product Licenses ....

License reporting

☐ Track license usage

☐ Download license usage   **1.** Downloading license usage data

Catalog > Product Licenses
page of web console

License awareness

☐ Notify virtual image owners when license usage reaches the thresholds set below

2. Configuring email notifications for a warning threshold

IBM products

Below are the products that can be deployed from this appliance. The list is generated by checking the contents of your virtual images against the product list in the IBM Software Catalog. You can specify how many processor value units (PVUs) you own for each product. When enabled, license awareness will alert you when PVU usage approaches a given threshold.

☐ Update IBM Software Catalog and Processor Value Unit (PVU) Table   **3.** Updating the software catalog or PVU table

Product	Product ID	Enforcement	Licenses owned (PVUs)	Notify if usage reaches	Licenses in use (PVUs)	Licenses reserved (PVUs)	In the cloud now
IBM WebSphere Application Server Hypervisor Edition	5724-X89	Ignore	0	90.0 %	0	0	0 virtual systems
IBM WS App Svr Hypervisor Ed for Novell SLES on Sys z-Novell Sub required	5725-A11	Ignore	0	90.0 %	0	0	0 virtual systems
IBM WAS Hypervisor Ed for Novell SUSE Linux Enterprise Svr for System z	5725-A12	Ignore	0	90.0 %	0	0	0 virtual systems
IBM WebSphere Application Server Hypervisor Edition on AIX	5725-A25	Ignore	0	90.0 %	0	0	0 virtual systems
IBM WebSphere Application Server Hypervisor Edition on RHEL	5725-A26	Ignore	0	90.0 %	0	0	0 virtual systems
IBM WebSphere Application Server Hypervisor Edition Intelligent Management Pack	5725-A27	Ignore	0	90.0 %	0	0	0 virtual systems

4. Adding products to the product list   **5.** Working with license enforcement options

8   License-aware management   © 2010 IBM Corporation

The Product License page in the web console is the central location for configuration license tracking options and monitoring license usage. The rest of this section of the presentation focuses on the data and activities shown on this page, including downloading license usage data for audit purposes, configuring email notifications for license usage, updating the software catalog or PVU table on your appliance, adding products to the product list, and working with license enforcement options. Note that, while the product list is shown on the Product Licenses page, you modify the list of available products by changing fields on your virtual images.

Downloading license usage data

- For each chargeable component, the appliance maintains maximum license consumption data
  - Tracked on a daily, weekly, monthly, lifetime basis
  - Monitor usage over time to assist with license planning
  - Provide audit records to IBM
- Download usage data in CSV format, filter by product or date

In the console, go to **Catalog > Product Licenses** then expand **Download license usage**

Download license usage

Download all data

Generate highwater mark usage data by selecting a product and a date range.

Product: IBM WebSphere Application Server Hypervisor Edition
Start date: Apr 27, 2010
End date: May 27, 2010

Download filtered data

9   License-aware management   © 2010 IBM Corporation

IBM expects you to maintain audit records that show you have been attempting to stay within your license entitlement. One way to do this is to periodically download and store these usage logs and keep them for auditing purposes. For each chargeable component – or process ID that is associated with an image on your appliance and found in the IBM Software Catalog – the appliance keeps a record of maximum license consumption data on a daily, weekly, monthly, and lifetime basis. The lifetime maximum value reflects the highest PVU usage ever recorded since the license was first recognized by the appliance and populated on the Product Licenses page. You can use this license usage data to assist you in license planning and provide an audit record of your license consumption to IBM. License are tracked as being either in use (consumed) or reserved. Only licenses that are actually in use are recorded in the audit logs; reserved licenses do not count against your entitlement. The license usage data is available in CSV format, and you can filter the download by product or date. Access these options from the Product Licenses page in the Download license usage section.

Configuring email notifications for a warning threshold

- The appliance can optionally email an administrator when license consumption reaches a specified threshold

- Enable notifications on the **Catalog > Product Licenses** page by:
  - Selecting the check box next to **Notify virtual image owners when license usage reaches the thresholds set below**
  - For the product you want to receive warnings for, provide the PVU pool and warning threshold
    - Independent of license enforcement configuration

License awareness

☑ Notify virtual image owners when license usage reaches the thresholds set below

IBM products

Below are the products that can be deployed from this appliance. The list is generated by checking the contents of your virtual images against the product list in the IBM Software Catalog. You can specify how many processor value units (PVUs) you own for each product. When enabled, license awareness will alert you when PVU usage approaches a given threshold.

⊞ Update IBM Software Catalog and Processor Value Unit (PVU) Table

Product	Product ID	Enforcement	Licenses owned (PVUs)	Notify if usage reaches	Licenses in use (PVUs)	Licenses reserved (PVUs)	In the cloud now
IBM WebSphere Application Server Hypervisor Edition	5724-X89	Ignore ⌄	2500 ⇅	90.0 % ⇅	0	0	0 virtual systems

10   License-aware management   © 2010 IBM Corporation

If you want to receive warnings when you are getting close to your product license limit, you can configure the appliance to send you email notifications. The warning threshold is set as a percentage of the total number of PVUs that you own for a particular product. In order to receive threshold email notifications, you must do two things. First, select the box labeled Notify virtual image owners when license usage reaches the thresholds set below. This box is not enabled by default and must be set manually to enable these email warnings. Second, for the products you want to receive threshold notifications about, you need to set the Licenses owned (PVUs) field in the user interface. Optionally, you can adjust the notification threshold percentage field; the default warning threshold is 90%. When your license usage reaches the specified threshold for the products you are tracking, an e-mail notification is sent to all of the users on your appliance who have the Create new catalog content role. These notification emails are sent regardless of the enforcement option that you have selected.

Updating the software catalog or PVU table

- Keep your appliance up-to-date by periodically importing the latest software catalog and PVU table

- From the **Catalog > Product Licenses** page:
    - 1) Download the latest copy of the configuration file from IBM using the links provided
    - 2) Point the appliance to the downloaded file and click **Update**

Update IBM Software Catalog and Processor Value Unit (PVU) Table

You should download and import the IBM Software Catalog and PVU Table on a regular basis so that the appliance has access to the latest licensing data. These are machine-readable files that contain the entire list of IBM products and the PVU conversion ratios for known processor types, respectively. These files are updated periodically at www.ibm.com.

Download IBM Software Catalog ①   Download Processor Value Unit (PVU) Table ①

Import IBM Software Catalog (XML or ZIP file)   **Import Processor Value Unit (PVU) Table (XML or ZIP file)**

Browse...   Browse...

Update ②   Update ②

IBMSoftwareCatalog.xml was last updated on Mar 22, 2010   PVU-table.xml was last updated on Mar 22, 2010 11:28:33 AM
11:27:28 AM (71130.78 KB)   (128.29 KB)

© 2010 IBM Corporation

License tracking in the appliance relies on two configuration files – the software catalog that contains the list of products that you can track licenses for, and the PVU table that contains the mappings of processor cores to PVUs that are used for counting the number of PVUs that your products are using. Both of these files must be present in your appliance configuration to enable license tracking. For new V2.0 appliances coming from IBM, these artifacts are pre-loaded on the appliance. When migrating from a previous release, you need to load these configuration files onto your appliance manually. Periodically, IBM updates the catalog and PVU table to include new software products and types of processor cores, so it is a good practice to periodically import an updated catalog and PVU table to keep your appliance up-to-date.

IBM maintains the software catalog and PVU table files and makes them available for download. From the Product Licenses page, the Download IBM Software Catalog link opens an FTP server connection. From that server, you can download the latest copy of the software catalog. Always download the catalog that has the has the string "canonical_form" in the file name. The Download Processor Value Unit (PVU) Table link redirects the browser to an IBM-hosted site where you can download the latest copy of the PVU table. Once you have downloaded the software catalog or PVU table to your local system, use the console to locate the file and upload it to your appliance.

Hardware PVUs

Typical hardware PVU information for a hypervisor

PVU score is editable, can be set manually if processor information is not available in the PVU table

Example of hardware PVU display when score information is not found in the PVU table

Once a PVU table is a part of your appliance configuration, you are able to see per-core PVU scores for the hypervisors that you have defined. From the hypervisor information page, the Hardware section provides processor information, include a count, type, and PVU score. The screen capture on the left shows a typical hypervisor display with hardware PVU information. Notice that the PVU score field is editable, as indicated by the dashed underlining. In the top example, the per-core PVU score is 50. If you are using very new hardware that is not yet included in the PVU table provided by IBM, or if you have not updated your PVU table recently, you might see a warning condition as shown on the bottom of this slide. In this second example, no PVU score was found in the PVU table for this type of processor. In this case, use the editable PVU score field to provide a PVU score for the processor manually. Doing so allows you to use the license management capabilities of WebSphere CloudBurst, even if you are unable to load a current PVU table on your appliance.

Adding products to the product list

- Products are added to the product list by:
  - Importing a new image into the catalog
    - Products included in the image are automatically added to the list
  - Manually adding a product ID to an existing image
    - Go to **Catalog > Virtual Images**, select a virtual image, and edit the **Product IDs** field

WebSphere Application Server 7.0.0.11	
Description:	IBM WebSphere Application Server Hypervisor Edition 7.0.0.11
Created on:	May 5, 2010 10:11:44 AM
Current status:	Read-only
Updated on:	May 5, 2010 1:06:20 PM
License agreement:	Accepted [view...]
Intelligent Management Pack:	Disable ▼ One or more patterns are using this image. You can clone it to change this setting.
Hypervisor type:	ESX
Operating system:	LINUX (RHEL5)
Version:	7.0.0.11
Image reference number:	200
Product IDs (e.g., 5724-X89):	5725-A26 ✖ 5725-A27 ✖ Click to add

The list of products that appears on the Product Licenses page is based on the product IDs that are associated with the virtual images in your appliance catalog. IBM tracks these products according to a product ID (PID) string. WebSphere Application Server Hypervisor Edition on Red Hat, for example, is associated with product ID 5725-A26. Virtual images have a Product IDs field that lists all of the products that are associated with that image. To add new products to the product list on the Product License page, you must import an image that already contains that product, or modify the product IDs field for an image in your catalog so that it contains the PID for the product that you want to track. For example, say that you are running extend and capture on one of the IBM-supplied virtual images. Then, during image extension, you install DB2® inside your image and capture that back to your appliance. If you want to track DB2 licenses when you deploy patterns based on your new image, all you need to do is add the appropriate DB2 product ID to your image. The Product IDs field is only editable until you deploy a pattern based on this image. After a copy of this image exists in your cloud, the product IDs field is locked.

Working with license enforcement options

- From the **IBM Products** section of the **Catalog > Product License** page, you can configure, per product:
  - Enforcement option (ignore/default, warn, enforce)
  - Number of licenses owned (PVUs)
  - Warning threshold (used for email notifications configured above)
- Appliance maintains a count of licenses in use and license reserved, based on currently deployed virtual systems
  - Reserved licenses include licenses in use and those reserved for virtual machines that are stopped
- Hover over virtual systems link to view a pop up list of virtual systems consuming licenses from this pool

Product	Product ID	Enforcement	Licenses owned (PVUs)	Notify if usage reaches	Licenses in use (PVUs)	Licenses reserved (PVUs)	In the cloud now
IBM WebSphere Application Server Hypervisor Edition	5724-X89	Ignore ▼ Ignore Warn Enforce	2500	90.0 %	0	0	0 virtual systems

14 License-aware management © 2010 IBM Corporation

The Product Licenses page contains a list of all of the IBM software products that your appliance is able to track licenses for. Each product has an associated product ID, enforcement option, number of PVUs owned, notification threshold, count of licenses in use and reserved, and a link to virtual systems currently in the cloud that contain the product.

The enforcement option, licenses owned, and notification threshold are configurable options. For enforcement, you can choose ignore, warn, or enforce; the option selected will influence the appliance's behavior at deployment time. The enforcement options are explained in more detail on the next page. The Licenses owned value represents the number of PVUs of the product that you have purchased from IBM, or your product entitlement. The email notification threshold indicates when your catalog administrators will receive notifications as you approach the limit of your license entitlement.

The remaining fields are not configurable; they are maintained by the appliance. As you deploy patterns from WebSphere CloudBurst, the virtual machines that are running in your cloud will consume licenses against your entitlement for the products that you are deploying. The appliance keeps track of the number of PVUs of these licenses that you have in use or reserved per product. Licenses in use are for virtual machines you have actively running in your cloud; reserved licenses represent the active virtual machines plus any additional PVUs that would be consumed if you started your stopped virtual machines. Reserved licenses are not included in audit reports and do not count against your entitlement. Regardless of the license enforcement option you have selected, the appliance will keep track of your licenses currently reserved and in use, as shown in the screen capture above. The In the cloud now column contains a link to all of the virtual systems that you currently have in your cloud that contain the product listed. By hovering over or clicking on the hyperlinked text, the console displays a pop-up menu that allows you to directly navigate to the virtual system details page for any of the systems that are consuming licenses for the associated product.

Comparing enforcement options

	Ignore	Warn	Enforce
Generate audit reports of license usage	✔	✔	✔
Email catalog administrators when license usage exceeds warning threshold (if enabled)	✔	✔	✔
Email deployer and catalog administrator when enforcement is triggered		✔	✔
Note in logs/history that license pool was exceeded		✔	✔
Make placement decisions to avoid exceeding license pool when approaching full utilization			✔
Force deployment failure when new deployment would exceed available licenses			✔

15   License-aware management   © 2010 IBM Corporation

The table on this page shows the differences in behavior for the license enforcement options. Ignore is the default option. When this option is selected, the appliance still tracks license usage and generates audit reports, but no action is taken at deployment time to warn users or restrict virtual machine creation. When the warn option is selected, deployments that would push you over your license entitlement are allowed to proceed, but additional warning messages are included in the virtual system history and log files, and administrators are notified that the license limit has been exceeded. Note that the email notifications sent to administrators and deployers when the license pool has been exceeded are not the same as the threshold notifications that are also configured from the Product Licenses page. The threshold emails are sent only to catalog administrators when the specified license usage threshold has been reached (for example, 90%), regardless of the enforcement option selected. The email notifications that are sent under the warn enforcement option are sent to both the deployer and the catalog administrators and happen when the deployment causes the license pool to be exceeded. When the enforce option is selected, deployments that would push you over your license entitlement are not allowed. In addition, as you approach your license limit, the appliance will make placement decisions that will help you avoid exceeding your entitlement.

Enforcement option example: Enforce

Step 1: In the console, go to **Catalog > Product Licenses** then set the **Enforcement** option for your product to **Enforce** and configure the number of **Licenses owned (PVUs)**

Product	Product ID	Enforcement	Licenses owned (PVUs)	Notify if usage reaches	Licenses in use (PVUs)	Licenses reserved (PVUs)	In the cloud now
IBM WebSphere Application Server Hypervisor Edition	5724-X89	Enforce ▾	100 ↕	90.0 % ↕	0	0	0 virtual systems

Step 2: Deploy a pattern that puts you over your license allotment, and the deployment will fail with a message saying **One or more licenses will exceed its total allocation**

For licensing test

Created on:	May 11, 2010 6:44:18 PM
From pattern:	WebSphere cluster (development)
Current status:	❗ One or more licenses will exceed its total allocation
Updated on:	May 11, 2010 6:44:55 PM

16   License-aware management   © 2010 IBM Corporation

When the enforce option is turned on, any deployment that will exceed the total license allocation is going to fail. During the deployment process, licenses are treated like other virtual system resources including memory and disk space. One of the first things that happens as the appliance attempts to place your virtual system in the cloud is a resource check to make sure that there are sufficient resources available to host the virtual machines for the image parts being deployed. As a part of this check, the appliance also verified license availability. If sufficient licenses are not available and the enforce option is configured, the deployment fails as shown in the screen capture above.

Enforcement option example: Warn

When the warn enforcement option is selected, deployments are allowed to continue, even if they cause you to exceed your license allocation. When licenses are exceeded, a warning is recorded in the virtual system history and logs, and email notifications are sent to the deployer and catalog administrators. On the Product Licenses page, the licenses being used and reserved include PVUs for the virtual system that generated the warning. In the example screen capture above, there is a red status indicator shown on the product licenses page to indicate that the licenses in use and reserved by this virtual system exceed the number of licenses owned.

Virtual machine state and license consumption

- Virtual machines can have licenses in use or licenses reserved (or both)
- Whether licenses are used or reserved depends on virtual machine state

Virtual machine state	PVUs in use?	PVUs reserved?
Inactive (deploying)	No	Yes
Starting or started	Yes	Yes
Stopping or stopped	No	Yes
Stored	No	No
Deleted	No	No

License-aware management   © 2010 IBM Corporation

The license tracking capabilities in the appliance report licenses as being either in use or reserved, depending on the state of the underlying virtual machine. In general, licenses are only consumed for virtual machines that are active – for example, while starting or in a started state. While the virtual machine is being created or when it is stopped, licenses are not consumed, but they are still reserved. Reserved licenses do not count against your entitlement pool for audit purposes, but knowing how many licenses are reserved helps you to understand how many licenses would be consumed if all of your virtual machines became active at the same time. When a virtual machine is stored or deleted, its licenses are no longer in use or reserved.

Command-line interface for license awareness (1 of 2)

- New license awareness object contains fields and methods to work with license tracking and reporting
- **Example:** Download the highwater license usage data file
  - `cloudburst.licenseawareness.highwatermarklicense.get('/tmp/highwater.csv','5728-X89',20100202,20100303)`
- **Example:** Enabling email notifications for a warning threshold
  - `cloudburst.licenseawareness.thresholdalert=True`
- **Example:** Importing a software catalog
  - `cloudburst.licenseawareness.ibmsoftwarecatalog.import('tmp/IBMSoftwareCatalog.xml')`
- **Example:** Importing a PVU table
  - `cloudburst.licenseawareness.pvutable.import('/tmp/PVU-table.xml')`

　　License-aware management　　

The capabilities that are available in the web user interface to configure license tracking and reporting are also exposed through the command line interface. There is a new license awareness object that supplies fields and methods for working with license usage data, email notifications, and importing the software catalog and PVU table. Examples of the syntax for these operations are provided on this page.

Command-line interface for license awareness (2 of 2)

- **Example:** Displaying the list of product IDs for an image
  - `cloudburst.virtualimages["WebSphere Application Server 7.0.0.11"][0].productids`
    - Result: `['5724-X89', '5725-A27']`

- **Example:** Adding a product ID to an image
  - `cloudburst.virtualimages["WebSphere Application Server 7.0.0.11"][0].productids=['5725-A26']`

- **Example:** Displaying the product list
  - `cloudburst.licenseawareness.products`

- **Example:** Update license data for a product
  - `cloudburst.licenseawareness.products[0].enforcement='E'`
    - `'E'=enforce, 'W'=warning, 'I'=ignore`
  - `cloudburst.licenseawareness.products[0].totalallocation=15000`
  - `cloudburst.licenseawareness.products[0].warningthreshold=20.0`

License-aware management

The virtual images object in the command-line interface can display product IDs associated with an image and supports programmatically modifying the product IDs for an image. When setting the product IDs field from the command-line interface, the default product IDs cannot be removed. In the second example shown on this slide, the IDs 5724-X89 and 5725-A27 will still be associated with the image, even though only 5725-A26 was included in the new product IDs list. The license awareness object also provides the ability to work with the product list. You can list information about the products, or chargeable components, that are currently being tracked by your appliance, and set configurable options – enforcement, total PVUs available, and warning threshold – from the command-line interface.

Section

How does PVU counting work?

License-aware management

This section highlights the basics of how PVU counting works with WebSphere CloudBurst to help you understand what the license tracking numbers mean and how to work through common problems and questions.
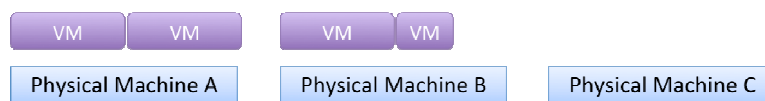
CB20_LicenseTrackingPlacement.ppt

How many PVUs are being used?

- Need two pieces of information:
  - Per-core PVU score
    - Varies by hardware type, typically in the 50 – 120 range
    - IBM maintains these mappings in the PVU table
  - Number of processor cores that the product can use
    - Depends on the virtual processor allocation for a virtual machine
    - Processor usage on a single physical machine can never exceed the number of cores on that physical machine

- For a given virtual machine, multiply these numbers together to determine the number of additional PVUs needed to run that VM in the cloud

PVU licensing is a pricing structure that takes into account the type and number of processors available to installed products. In order to determine how many PVUs are used for a deployment, two pieces of information are needed. First, you need the per-core PVU score. This varies by hardware and is maintained in the PVU table. The second piece of information is the number of un-allocated processor cores that the product can use. This depends on the virtual processor allocation for a virtual machine and the overall processor consumption in the cloud. To determine the number of PVUs needed to run a particular VM in the cloud, you can multiply these two values together. In a virtualized environment, IBM's PVU counting model will never charge you for more PVUs than are available on the physical hardware in your cloud.

Example: PVU counting

- Three physical machines (A, B, C) in the cloud, each with four processor cores

- Assume that each processor core has a PVU score of 100

- Four virtual machines in the system already; three with two virtual cores, one with one virtual core
  - Size of the VM box indicates number of cores

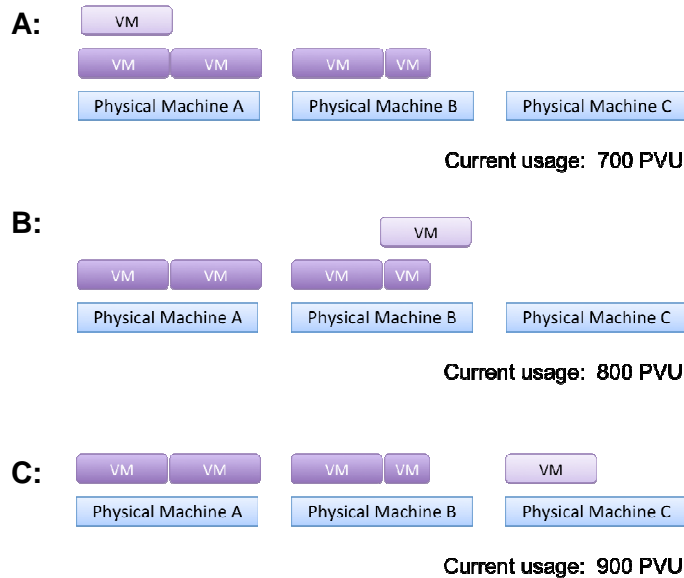- All virtual machines contain the same product (WebSphere Application Server)

VM	VM		VM	VM
Physical Machine A		Physical Machine B		Physical Machine C

Current usage: 700 PVU

License-aware management   © 2010 IBM Corporation

To better understand PVU counting, it helps to see some examples. The next two slides consider a hardware environment with three physical machines, A, B, and C. These machines each have four processor cores with a PVU score of 100. The virtual machines all contain the same product, WebSphere Application Server Hypervisor Edition.

This example starts with four virtual machines deployed into the cloud, as shown on this slide. Three of the virtual machines have been allocated two virtual cores, and the fourth virtual machine has one virtual core. Pay close attention to the placement of the virtual machines, that is, the physical piece of hardware where the virtual machines are running. In this example, the virtual machines are spread across both physical machines A and B. Taken together, these four virtual machines have been assigned seven virtual cores and have full access to underlying physical cores on the hardware. In this case, the PVU consumption for these virtual machines is 700 PVUs.

Example: Impact of placement on PVU consumption

- Add a new VM to the cloud that has two virtual cores
  - PVU consumption will vary, based on where WebSphere CloudBurst places the VM (A, B, C)

A:

| VM |

| VM | VM | | VM | VM |

| Physical Machine A | | Physical Machine B | | Physical Machine C |

Current usage: 700 PVU

B:

| VM |

| VM | VM | | VM | VM |

| Physical Machine A | | Physical Machine B | | Physical Machine C |

Current usage: 800 PVU

C:

| VM | VM | | VM | VM | | VM |

| Physical Machine A | | Physical Machine B | | Physical Machine C |

Current usage: 900 PVU

24   License-aware management   © 2010 IBM Corporation

Now, consider what happens when you add another virtual machine to the cloud. This virtual machine has been allocated two virtual cores. The overall PVU consumption of the cloud is going to vary depending on where this new virtual machine is placed.

Say that the new virtual machine is placed on physical machine A, as in the first diagram at the top of the slide. In this case, the three virtual machines running on physical machine A take up six virtual cores, but there are only four physical cores available on the box. In this case, it is not possible for the virtual machines to consume more than four physical cores at any given time, so the overall PVU consumption of the cloud does not change from the previous slide – it is still 700 PVUs. This example shows that it is possible to add a virtual machine to the cloud without consuming any additional PVUs.

In the second case, when the new virtual machine is deployed to physical machine B, there is still overlap of the virtual and physical cores, but not quite as much as in the previous example. On box B, hosting this new virtual machine causes the fourth physical core to be counted, but the second virtual core in the virtual machine does not cause any additional PVUs to be consumed. Here, the total PVU consumption is 800 PVUs.

The third example shows the new virtual machine being deployed to physical machine C. In this case, there is no overlap of virtual and physical cores, so simply counting the number of virtual cores and multiplying by the PVU score is sufficient to determine the total PVU consumption of 900 PVUs.

How many PVUs must be purchased to fill up the cloud?

- The cloud group information page contains a new field, **Hardware PVUs**
  - **Example:** This cloud contains a single hypervisor with eight Intel® processors with a PVU score of 50 each, for a total of 400 PVUs
- If you want to "fill up" this cloud group with WebSphere Application Server, you need an entitlement of 400 PVUs
  - This cloud group can never consume more than 400 PVUs' worth of the application server

On the cloud group details page, there is a new field called Hardware PVUs that shows the total number of PVUs that are available on all of the hypervisors in this cloud group. For example, the cloud group shown contained a single hypervisor system with eight processor cores, each with a PVU score of 50, resulting in a total of 400 PVUs. If you intend to fill up this cloud group with WebSphere Application Server – or fully use the hardware available in the cloud from a licensing perspective – you need to purchase 400 PVUs of the application server. Another way to think of this is that, regardless of how many virtual machines you deploy to this cloud group, they can never consume more than 400 processor value units from your entitlement pool.

Comparing instances and PVUs

- **Question:**
  - My license pool is set to three, and none of the licenses are being used. License enforcement is set to enforce. I am trying to deploy a single server pattern with a single virtual processor, but it fails. I still have three licenses left, so why isn't license enforcement letting me deploy this pattern?

- **Answer:**
  - This scenario is confusing the number of instances of the application server with PVUs
  - Product licensing is based on PVU consumption, not a simple count of the instances of a product
  - PVU consumption depends on the type and number of cores being used by the product
  - Depending on the current hardware utilization in the cloud, a single instance of the application server running with one virtual processor typically consumes 50 - 120 PVUs

26   License-aware management   © 2010 IBM Corporation

A common misconception about licensing is that licenses are counted as several instances, but IBM actually counts licenses using processor value units. In this case, a user has license enforcement turned on and is seeing pattern deployment fail because of a lack of licenses. Having three PVUs available will never be sufficient to deploy even a single instance of the application server on a single core. Most users have a total entitlement of hundreds or thousands of PVUs of the application server. It is important to make sure that your total number of licenses available is configured accurately according to your entitlement, and that you are thinking about licenses in terms of processor value units and not a number of instances. For most common processors, a single core corresponds to somewhere between 50 and 120 PVUs.
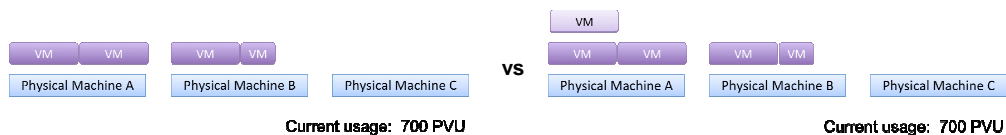
PVU sharing: deploying after reaching the limit

- **Question:**
  - My PVU pool has 0 available licenses, and I'm using the enforce option for my deployments, but I was still able to deploy new instances of the application server into my cloud. How is that possible?

- **Answer:**
  - This is a legitimate scenario in cases where the new application server instances are being created on a system whose physical cores are all already hosting a copy of the product
    - In the diagram on the right below, adding the top VM to the cloud does not change the overall PVU consumption

VM	VM		VM	VM				VM	

VM	VM	VM	VM		VM	VM	VM	VM

Physical Machine A	Physical Machine B	Physical Machine C	**vs**	Physical Machine A	Physical Machine B	Physical Machine C

Current usage: 700 PVU　　　　　　　　　　　　Current usage: 700 PVU

　　License-aware management　　

This question highlights the idea that it is possible to deploy a new virtual machine into your cloud and not consume any additional PVUs. In the PVU counting examples shown earlier, you saw exactly this scenario. The related diagrams again on this page for your reference. The key idea here is that, in a virtualized environment, IBM does not charge your for more PVUs than are available from your physical hardware. In the case of WebSphere CloudBurst, this can result in being able to deploy new virtual machines even when you have restricted enforcement enabled and do not have any licenses available.
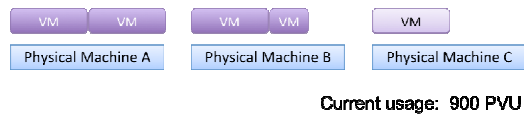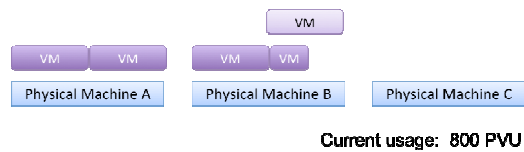
PVU sharing: usage per virtual system

- **Question:**
  – So now that the appliance is tracking where my PVUs are going, I'd like to be able to track which virtual systems (or which users) are consuming which licenses. Where can I see this?
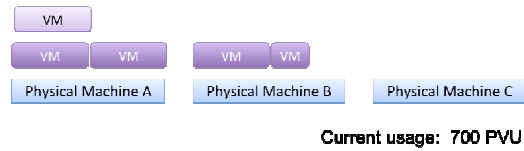
- **Answer:**
  – Because of PVU sharing on a given piece of hardware, the concept of allocating PVUs to a virtual system does not have meaning
  – Location of a VM in relation to the others in the cloud impacts how many PVUs it requires from the pool

VM
VM VM   VM VM
Physical Machine A   Physical Machine B   Physical Machine C

Current usage: 700 PVU

VM
VM VM   VM VM
Physical Machine A   Physical Machine B   Physical Machine C

Current usage: 800 PVU

VM VM   VM VM   VM
Physical Machine A   Physical Machine B   Physical Machine C

Current usage: 900 PVU

This last question highlights the fact that you are not able to track PVUs to a specific virtual system. This concept of attaching PVUs directly to a virtual system is challenging because PVUs on a given piece of hardware can be shared across several virtual systems. Placing the same virtual system on different physical hardware in the cloud can lead to widely variant PVU counts for virtual environments that represent a consistent topology. Similarly, the appliance does not report PVU consumption per user account. Again, counting PVUs at the user account level does not make sense because of the way that PVUs can be shared across systems. The PVU counts are determined by looking at the entire scope of virtual machines that you have running in your cloud, rather than looking at virtual machines in isolation. The virtual system details page does provide a list of IBM products that are being counted in that virtual system and associated PVU counts. However, it is important to realize that these PVU counts are not the actual number of PVUs that are being consumed by your virtual machine – they are the number of PVUs that would be consumed by the virtual machine if it were the only virtual machine in the world. That is, these PVU counts do not take into account the PVU sharing that occurs in official PVU counting.

Summary and references

License-aware management © 2010 IBM Corporation

This section contains a summary and references.

Summary

- License awareness in WebSphere CloudBurst allows you to:
  - Track license usage in your cloud and generate audit reports
  - Understand how many license you need to purchase to make the most use of your cloud
  - Enforce placement decisions based on available licenses

License-aware management

WebSphere CloudBurst provides built-in capabilities for license tracking and reporting. The appliance allows you to track license usage, generate audit reports, and enforce placement decisions based on license availability. Having knowledge of how you are consuming product licenses can help you understand how many licenses you need to purchase to make the most use of your cloud. Using license tracking can also help you to keep from inadvertently going over your license entitlement.

References

- IBM License Metric Tool
  http://www.ibm.com/software/tivoli/products/license-metric-tool/
- PVU table
  http://www.ibm.com/software/lotus/passportadvantage/pvu_licensing_for_customers.html
- Counting PVUs in virtualized environments
  http://www.ibm.com/software/lotus/passportadvantage/Counting_Software_licenses_using
  _specific_virtualization_technologies.html

License-aware management

This page provides links to additional license tracking resources.

Feedback

Your feedback is valuable

You can help improve the quality of IBM Education Assistant content to better meet your needs by providing feedback.

- Did you find this module useful?

- Did it help you solve a problem or answer a question?

- Do you have suggestions for improvements?

Click to send email feedback:

mailto:iea@us.ibm.com?subject=Feedback_about_CB20_LicenseTrackingPlacement.ppt

This module is also available in PDF format at: ../CB20_LicenseTrackingPlacement.pdf

License-aware management

You can help improve the quality of IBM Education Assistant content by providing feedback.